THIRD ANNUAL REPORT

OF THE

EXPERIMENT STATION

OF THE OREGON

State Agricultural College

TO THE

Governor of Oregon,

For the Year Ending June 30, 1891.

1891

AGRICULTURAL COLLEGE PRINTING OFFICE.
H. R. CLARK, Manager,
CORVALLIS, OREGON:
1892.

CORVALLIS, OREGON, February 16th, 1892.

To His Excellency, Governor Pennoyer:

SIR:—In accordance with section 5 of the Act of Congress usually called The Hatch Act, relating to Agricultural Experiment Stations, I beg to submit to you a financial statement of receipts and disbursements of the Oregon Agricultural Experiment Station for the year ending June 30, 1891, and also a report by the late President and Director B. L. Arnold, of the operations of the Station for the same year, also a financial statement of the Agricultural College receipts and disbursements for the same year.

Very Respectfully,

WALLIS NASH,

Secretary of the Board of Regents,

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1886

The State Agricultural College of Oregon.

AGRICULTURAL EXPERIMENT STATION FUND.

Report of Special Committee of the Board of Regents at the Annual Board Meeting held at Corvallis, Oregon, on June 24th 1891.

To His Excellency, Governor Sylvester Pennoyer, Governor of Oregon:

SIR:—We, the special Committee of the Board of Regents of the State Agricultural College, to whom was referred the duty of examining and reporting on the accounts of the Treasurer of the State Agricultural College, who is also Treasurer of the Hatch Experiment Station fund, beg to report as follows:

We have considered the summary of expenditures and receipts furnished us by the Treasurer, Hon. T. E. Cauthorn, a copy of which is hereunto attached, and we have examined the Treasurer's books, and the vouchers submitted by him. We find the books well kept and correspond with the vouchers produced. And we report that the summary so attached hereto correctly shows the receipts and payments of the said Treasurer, of and relating to, the Hatch Agricultural Experiment Station fund, between the 1st day of July, 1890, and this 24th day of June, 1891.

Very Respectfully,

W. P. KEADY.
A. R. SHIPLEY.
H. E. HAYES.

Corvallis, Oregon, June 24th, 1891.

REPORT OF TREASURER.

To the Board of Regents of the State Agricultural College:

CORVALLIS, OREGON, June 24th, 1891.

GENTLEMEN:—I beg to submit the following statements of the receipts and disbursements made by me as Treasurer during the past year—both on College Income account—the Hatch Experiment Station account, and the account of disbursements on account of the appropriations made by the Board in January last of the $15,000—first, or preliminary, payment under the new Morrill Act.

All books, papers, vouchers, and documents are herewith submitted for examination.

I desire to commend Mr. H. R. Clark, your Clerk, for his industry and care in keeping the accounts during the past year. Monthly statements of the outgoings have been kept up by him, and a careful scrutiny of all orders and requisitions for purchases.

Very Respectfully,

T. E. CAUTHORN.
By W. N.

The Agricultural Experiment Station of Oregon,

Under Control of the

STATE AGRICULTURAL COLLEGE OF OREGON.

Distribution of Expenditures for Year Ending June 30, 1891.

Fencing and Drainage	$ 414 06
Labor	2921 66
Scientific Instruments	175 31
Greenhouse Heating Apparatus	166 50
Tools and Machinery	273 61
Apparatus and Supplies	935 94
Museum	150 00
Food for Stock	177 64
Salaries	7270 00
Freight, Expressage and Drayage	237 85
Library	210 95
Postage	69 75
Supplies	531 68
Incidentals	80 51
Printing	65 25
Printing Bulletins	582 15
Mailing Bulletins	62 05
Institutes	286 20
Miscellaneous	277 19
Meteorology	111 00
	$14999 30

Statement of Disbursements by Departments for the Year Ending June 30th, 1891.

AGRICULTURE.

Fencing and Drainage	$ 414 06
Labor	1632 33
Tools and Machinery	235 81
Food for Stock	168 24
Museum	34 50
Freight, Expressage and Drayage	43 70
General Fittings	13 54
Incidentals	13 90
Library	44 17
Postage	24 45
Printing	17 25
Supplies	125 77
Salaries	1920 00
	$ 4687 72

BOTANY.

Scientific Instruments	$ 127 93
Labor	31 25
Freight, Expressage and Drayage	82 40
Incidentals	18 50
Library	48 18
Postage	11 00
Printing	7 00
Supplies	134 31
Salaries	1000 00
	$ 1460 57

HORTICULTURE.

Greenhouse and Heating	$ 166 50	
Labor	1084 04	
Tools and Machinery	17 80	
Food for Stock	9 40	
Museum	17 50	
Freight, Expressage and Drayage	7 51	
General Fittings	60 00	
Incidentals	13 00	
Library	9 50	
Postage	3 50	
Supplies	81 96	
Salaries	450 00	
		$ 1920 71

CHEMISTRY.

Apparatus and Supplies	$ 805 40	
Labor	105 29	
Freight, Expressage and Drayage	82 02	
Library	45 67	
Postage	11 00	
Printing	17 40	
Supplies	11 46	
Salaries	1000 00	
		$ 2078 24

ENTOMOLOGY.

Scientific Instruments	$ 47 38	
Labor	68 75	
Tools and Machinery	20 00	
Museum	98 00	
Freight, Expressage and Drayage	22 22	
General Fittings	57 00	
Incidentals	35 11	
Library	63 43	
Postage	19 80	
Printing	23 60	
Supplies	178 18	
Salaries	1000 00	
		$ 1633 47

METEOROLOGY.

Salary	$ 111 00	
		$ 111 00

REPORT OF TREASURER

In Respect of Receipts Under the New Morrill Act Approved August 30, 1890.

Received from Treasurer of U. S. Dec. 10, 1890	$15000 00	
" " " " " May 25, 1891	16000 00	
June 30th, 1891, Disbursed for instruction and facilities:		
In Agriculture as per Schedule A		$ 5303 37
" Mechanic Arts " " " B		6936 77
" English Language " " " C		3990 70
" Mathematical Science " " " D		3770 50
" Physical Science " " " E		3378 69
" Natural " " " " F		5156 22
" Economic " " " " G		2477 97
Totals for Year	$31000 00	$31014 22

Details of above Expenditures.

SCHEDULE "A," AGRICULTURE AND HORTICULTURE.

Salaries, H. T. French	$ 400 00
" Geo. Coote	450 00
Apparatus	1212 18
Machinery	1748 14
Text Books and Reference Books	89 10
Stock and Materials	1403 95
	$ 5303 37

SCHEDULE "B," MECHANIC ARTS.

Salaries, G. A. Covell	$ 1600 00
" G. W. Swallow	600 00
Apparatus	2336 77
Machinery	2100 00
Stock and Material	300 00
	$ 6936 77

SCHEDULE "C," ENGLISH LANGUAGE.

Salaries, B. L. Arnold	$ 1500 00
" W. A. Lampkin	840 00
" F. Berchtold	1600 00
Text Books and Reference Books	50 70
	$ 3990 70

SCHEDULE "D," MATHEMATICAL SCIENCES.

Salaries, J. D. Letcher	$ 1800 00
" W. W. Bristow	1600 00
Apparatus	325 00
Text Books and Reference Books	45 50
	$ 3770 50

SCHEDULE "E," PHYSICAL SCIENCE.

Salaries, P. H. Irish	$ 600 00
Apparatus	2718 69
Text Books and Reference Books	60 00
	$ 3378 69

SCHEDULE "F," NATURAL SCIENCE.

Salaries, F. L. Washburn	$ 600 00
" E. R. Lake	600 00
Apparatus	2376 82
Microscopes	940 00
Text Books and Reference Books	85 85
Museum	553 55
	$ 5156 22

SCHEDULE "G," ECONOMIC SCIENCE, ECONOMY AND HYGIENE.

Salaries, Miss M. C. Snell, M. D.	$ 1100 00
Apparatus	384 45
Library	993 52
	$ 2477 97

STATE FUNDS, ETC.

Cash Received from State of Oregon, Tuition, Sale of Products, Etc., from July 2, 1890, to June 17, 1891.

1890.			
July	2, State of Oregon	$ 4500 00	
Sep.	4, Sale of Wheat	372 75	
"	16, Tuition	170 00	
"	18, Improvement	33 30	
"	24,	286 79	
"	30, Tuition	75 00	
Oct.	4, Interest Fund	2500 00	
"	4, General "	1666 66	
Dec.	8, State of Oregon	833 33	
1891.			
Jan.	5, Sale of Buckwheat	18 40	
"	5, Sale of Plants	16 25	
"	5, Tuition	65 00	
"	6, "	280 00	
"	9, General Fund	1666 66	
"	9, Interest "	3257 91	
"	13, Tuition	100 00	
Mar	13, Sale of Cow	40 00	
"	19,	24 35	
"	20,	10 00	
"	27, Tuition	100 00	
Apr	9, Interest Fund	2662 29	
"	11, Tuition	377 50	
June	12,	83 35	
"	17,	9 68	
			$19149 22

Expenditures on State Appropriations.

Care of Grounds	$ 400 00	
Current Expenses	659 53	
Sanitary	313 00	
Outfit	400 00	
Repairs and Betterments	793 36	
Traveling Expenses	384 75	
Attorney Fees	284 35	
Improvement Fund	1462 53	
Proportion of Student Labor	1416 02	
Wood for Fuel	608 73	
Clearing Land	595 75	
Advertising and Printing	414 88	
Balance 1889-90	871 73	
Remaining to be paid on account of Expenditures authorized and incurred prior to June 30, 1891	131 70	
		$ 8736 33

SUMMARY.

RECEIPTS.

Rec'd. from State and Sale of Products, Tuition, etc.	$19149 22	
Cash Received from U. S. Government	31000 00	$50149 22

DISBURSEMENTS.

Amount as per Schedule A, B, C, etc.	$31014 22	
Am't. as per "Expenditures on State Appropriations"	8736 33	
Cash Bal. Transferred to A. R. Shipley, Treas.	*10398 67*	$50149 22

Report of B. L. Arnold, A. M., President of State Agricultural College, and Director of Experiment Station.

Prefatory Remarks.

The Agricultural College of Oregon has had during most of its existence a varied and fluctuating fortune. For fifteen or sixteen years after its first organization (for it has had two distinct organizations) it was under the control of a private church school and the dissatisfaction in the public mind at this arrangement kept it from the prosperity it ought to have enjoyed. The most strenuous efforts were indeed required to keep the school alive. Since its new organization under the state control it has received new life and is now a growing institution, becoming more and more efficient as a means of educating the industrial classes. By the work of the college itself in tuition, bulletins, farmers' institutes, the people are becoming aroused to the great importance of the Agricultural College both as a social and as an educating power. The policy of the school is fixed in harmony with the Act of Congress of 1862 and may be expressed by saying that all its work must tend to create in the community an educated class of farmers, mechanics, and housekeepers. This policy the authorities are carrying out along two lines of work, the work of educating by tuition the youth who attend upon instruction at the college, and the work of educating the community at large by bulletins and farmers' institutes. The work for students takes three forms,—first, a course of liberal instruction; secondly, a course of technical instruction, and thirdly, a course of practical instruction. The work for the community requires, first that certain problems relating to agriculture be investigated; and secondly that the results of such investigation be given to the public. This is done by bulletins and farmers' institutes. It is the intention of the Board of Regents that nothing shall come between the ends proposed and the working of the institution. There may arise differences of opinion about the methods and means to be used in order to obtain the proposed end, but none about the work itself. How far we are living up to the ideal it is the object of this report to show. But it may be well to give here a few explanatory statements.

From the foregoing remarks it follows that the station is considered and treated as a part of the college, a distinct part indeed, but yet a part, and one used as a means for attaining the end proposed by the institution for its work. Accordingly all the members of the station staff are also pro-

1. Interior of Workshop. 2. Zoological Laboratory. 3. Chemical Lecture Room.

fessors in the college. As a consequence of this less station work is done than might be done by the same staff under a different plan; but it follows also that the work of the institution as a whole can be done more cheaply and perhaps more efficiently. At the same time this arrangement secures that unity of sentiment in the community so necessary to the prosperity of the school. A different arrangement might cause the existence in the community of two parties; a pro-station party and a pro-college party, which would be a great misfortune. There was at first in fact an attempt made by disaffected parties to bring about in the public mind such a division of sentiment, and this attempt led the board of regents to merge in one head the directorship of the station the presidency of the college. Under our present arrangement the chemist, for illustration, has three lines of work, first, station work; secondly, college work of teaching; and thirdly the work required by the food commissioner of the State. The agriculturist has to give instruction in agriculture and do station work besides; and the same is true ot the botanist, the entomologist, and the horticulturist. I have thought it simple justice to the members of the staff to say this as more might be expected of them than could be reasonably required. With reference to the departments of botany and horticulture a general remark is necessary. Some changes, although necessary, have rendered these departments less efficient than they might have been. At the organization of the station the two departments were united and put under the control of one man; this arrangement continued for two years, when the department was divided between two men, a botanist and a horticulturist: before the expiration of the third year the botanist vacated his chair and his work was left in an unfinished state. A series of experiments, mostly new, was begun by the present horticulturist upon his taking charge of the horticultural department; but as yet the time is too short to expect any very trustworthy results; these facts show why I cannot give any definite work as done by the botanist and why but little can be reported by the horticulturist. He has many valuable experiments in progress, but not finished work as yet. The general conditions under which experiments of the station have been made require a word. I cannot give the meteorological condition with scientific exactness although we keep here a record of the weather signals. I can only state that the seasons have not been exceptional, no extreme heat or extreme cold and the same is true of rainfall; the seasons have in short been fair, average seasons. The experiments in agriculture and horticulture so far have all been made without the application of fertilizers as a condition that should modify experiments. We are not experimenting with plants as affected by fertilizers. We have therefore in general used the natural soil. A line of work respecting fertilizers will be taken up hereafter, but as yet we are governed largely by local demands regarding experiments. Our state has not yet come to feel the need of fertilizers, to any great extent at least. This leads me to remark that we are planning an agricultural survey of the state, in order both to anticipate any future demand for information respecting fertilizers, and other matters relating to agriculture, and also to take preliminary steps toward the establishment of branch stations should need for these arise. I

hope to embody this plan in the next report. A remark of some importance respecting the climate as affecting the work of the entomologist is that in this state the climatic conditions are such that injurious insects appear at an earlier date and are destructive for a longer period during the summer than those indicated in publications on insect pests east of the Rocky mountains; this remark should be kept in mind while reading the report of the entomological department. I have entered into detail no further than to give a fair account of the work done. As to the station, details, required for instruction, will be found in the bulletins. Results of general interest (the entomological for example) are stated more fully than those of merely local interest. I have accordingly omitted the varieties of wheat and potatoes reported by the agriculturist as suited to our soil and climate. I have not thought it advisable to classify the experiments as those of verification and those of a tentative kind, this involving formality better suited to a purely station report. It has not, again, been found possible to draw a very sharp line between the work of 1890 and that of previous years; hence some of the work reported for 1890 must be regarded as the continuation of previous work.

In conclusion I wish to say that the Agricultural college of this state is in a sound condition, is free from debt and most of the dissatisfaction and misunderstandings formerly existing in the public mind are passing away; unity of sentiment is springing up in the community, and people in general seem willing to give a helping hand; at the same time the authorities are doing all they can to make the institution successful. In order to bring its advantages within the reach of every one, they have reduced tuition, board, etc., to a minimum, students being provided with board, lodging, lights, and heat in the halls for nine dollars per month. Our State, too, has been liberal; furnishing money for the erection of necessary buildings, such as mechanical hall, barns, students' halls,—one for girls and one for boys,—and a station building now in process of erection, the total expenditure for this purpose and for the purchase of the college farm amounting to $69,000 or thereabouts.

My thanks are due to the Board of Regents for cordial co-operation and support; they have worked assiduously and earnestly to make the best use of the trust committed to their charge. The station staff and the college faculty have done faithful and good work, and are striving to make, each his respective department, alike useful and creditable.

HISTORY.

Ninety thousand acres of land fell to Oregon by the Congressional Act of 1862, making grants of land to each state and territory of the United States for the endowment of colleges to teach agriculture and the mechanic arts.

By an Act approved October 9, 1862, the legislative assembly of Oregon accepted the provisions of the congressional law.

In 1868 the legislature appointed three commissioners to locate the land.

The location was made and the commissioners reported their work in 1870.

There were in 1868 no state colleges in Oregon, and the same legislature that provided for the location of the land gave the use of the funds that should arise from the sale of the land to the Corvallis college, in Benton county, an institution of learning under the control of the M. E. Church, South. When this was done, none of the land of the land grant had yet been sold, and the legislature made an annual appropriation to support the school till the land fund should become sufficient for that purpose. The appropriation, though small, was enough to keep the feeble spark from expiring.

In 1885 the church relinquished (voluntarily) its claim on the funds of the Agricultural College, and the state resuming control, an act was passed whose provisions are essentially those contained in the sections below:

Section 1, provides for the relocation of the college at Corvallis under the condition that a brick building to cost not less than $20,000 be erected (near Corvallis) on the Agricultural College farm for the Agricultural College.

Section 2, incorporates a board of regents and vests them with the general government of the college; granting full power to that end.

Section 3 provides for the constitution of the board of regents, declaring that the state board of education and the master of the state grange for the time being shall be ex-officio members; that nine others shall be appointed by the governor, by and with the advice and consent of the senate, not more than five of which nine members appointed by the governor shall belong to the same political party. The remaining part of this section provides for filling vacancies and appointing successors.

Section 4 provides for the organization of the board of regents and for the existence of an executive committee.

Section 5 requires the president of the board to make a yearly report to the governor of the state.

Section 6 reads as follows: That the course of instruction and studies at the said college shall be prescribed by the said board of regents, and shall be in accordance with objects sought by Congress in the establishment of state agricultural colleges, namely, instruction in agriculture and the mechanic arts.

Section 7 provides for drawing money by the college from the state treasury.

Section 8 requires a tuition fee; it also provides for as many free scholarships (one-third of which may be for females), for each senatorial district as said district has of senators and representatives in the legislative assembly, and an additional one for each county, and prescribes the manner of appointment to these scholarships.

Section 9 reads as follows:.....

"For the endowment, maintenance and support of said agricultural college there is hereby set apart and appropriated the interest of the fund that has arisen and which shall arise from the sale of all lands granted to the state of Oregon or to which such state was entitled by act of congress to provide colleges for the benefit of agriculture and the mechanic arts to

the several states and territories, approved July 2, 1862, and the acts amendatory thereof or so much thereof as may be necessary; but in no case shall the interest arising from said fund be applied to the purchase of sites or for buildings for said agricultural college, but only to the payment of the salaries of professors, officers, and other current expenses.

"The remainder of such interest remaining over at the end of each fiscal year after the payment of such expenses shall be added to and become a part of the principal or endowment fund forever."

Section 11 provides for the acceptance of the building by the governor.

Section 13 reads: "Corvallis College, in Benton county, having signified its intention and desire to relinquish to the State the control and management of the State Agricultural College, the same is hereby accepted to take effect at the time and in the manner provided in this act."

While the church held the school from 1868 to 1883 agricultural science was regularly taught as enforced study to such pupils as held free scholarships and to such others as might desire to take agricultural studies, but I may remark in passing, that during my connection with the college (from 1872 to 1888) there was never a single instance of a student's volunteering to take agricultural studies so far as I remember.

There was not then, and the same is true to-day, a general felt need of scientific agricultural education.

Such feeling is, of course, a product of such education itself, and hence the great importance of the agricultural colleges; the desire once awakened, there will be no trouble about the education. Such conscious desire as does exist, exists in the minds of the older people, and not to any appreciable extent in those of the young who ultimately settle the matter of their education.

While the church controlled the school, there was an attempt (and the same policy continues to-day) to popularize the college by taking advantage of the grange sentiment, and by an attempt to bring the school largely under the influence of farmers, hence, there seems to exist to-day a tacit feeling that the agricultural college is designed especially for the benefit of the farmers, and that it is their school, emphatically, that it is their especial business to foster it and manage it and patronize it. Of course everybody in the state is equally interested in the institution and should be made to know that as soon as possible.

To return from this digression: In accordance with one of the provisions of the act aforesaid, the people of Benton county erected a suitable brick building of the following dimensions:—78x107 feet, three stories high, containing 15 rooms and a furnace room 40x60. Twelve of these rooms are 29x30 in size and are used for lecture rooms and laboratories. There are two rooms 25x40, the one being used for the library, and the other for the museum. The chapel is 60x40. The governor having in 1888 accepted this building as required by the above act, the board of regents took charge of it and reorganized the school by prescribing a course of study and appointing a faculty. This course of study, after some revision, has assumed the following form and is the one now in force.

Course of Study.

FIRST YEAR.

	Agriculture.	Mechanics.	Household Economy.
Fall Term.	Algebra, English, History, Book-keeping.	Algebra, English, History, Book-keeping.	Algebra, English, History, Book-keeping, Sewing.
Win. Term.	Algebra, English, History, Drawing, Horticulture.	Algebra, English, History, Drawing, Shop-work.	Algebra, English, History, Drawing, Horticulture, Sewing.
Spr. Term.	Algebra, English, Drawing, Chemistry, Agriculture.	Algebra, English, Drawing, Chemistry, Mech. Drawing.	Algebra, English, Drawing, Chemistry, Sewing.

SECOND YEAR.

	Agriculture.	Mechanics.	Household Economy.
Fall Term.	Geometry, Chemistry, Agriculture, Horticulture.	Geometry, Chemistry, Mechan. Drawing Shop-work.	Geometry, Chemistry, Horticulture, Languages, (Optional) Preserving & Canning of Fruits, Cooking.
Winter Term.	Geometry, Chemistry, Zoology, Agriculture.	Geometry, Chemistry, Mechan. Drawing Shop-work.	Geometry, Zoology, Modern History, Chemistry, Marketing & Chemistry of Cooking, Cooking. Languages, (Optional).
Spring Term.	Trigonometry, Chemistry, (½) Agriculture, (½) English, Zoology.	Trigonometry, Chemistry, (½) English, Shop-work.	Trigon. or Ancient His., English, Floriculture, Zoology, Languages, (Optional) Dressmaking, Sewing.

Course of Study.

THIRD YEAR.

	Agriculture.	Mechanics.	Household Economy.
Fall Term.	Surveying, (½) Road-making, (½) Botany, Physiology, Agriculture.	Anal. Mechanics, " Geometry, El. of Mechanism Drawing, Shop-work.	English Literature, Botany, Languages, (Optional) Dressmak. & Millinery, Physiology.
Win. Term.	Physics, Meteorology, Physiology, (½) Agriculture, (½) Plant Physiology.	Anal. Geom., (½) Calculus, (½) Physics, Mechanism, Machine Design, Shop-work.	Special Hygiene, English Literature, Languages, (Optional) Physiology, (½) Physics or Meteorology.
Spring Term.	Physics, Entomology, Botany, Pol. Economy.	Calculus, Pol. Economy, Physics, Steam Engine and Motors, Drawing & Design	House Furnishing and Kitchen Gardening. Pol. Economy, Languages, (Opt.) and Two of these. { Physics, Botany, Entomology.

FOURTH YEAR.

	B. S. Course.	B. M. E. Course.	B. L. Course.
Fall Trm.	Analytical Geom. Logic, Physics, Language,	Mechanics, Logic.	English Literature, Language, Logic, Social Etiquette.
Win. Term.	Anal. Geom., (½) Calculus, (½) Minerology, Psychology, Language.	Mechanics, Psychology.	English Literature, Psychology, Language, Sanitary Science.
Spr. Term.	Calculus, Ethics and Constitutional Law, Geology, Language.	Mechanics, Ethics and Constitutional Law.	English Literature, Ethics and Constitutional Law, Language, Care of the Sick.

The Agricultural Department.

A remark common to the departments of agriculture, mechanics and household economy may be made here. Since it is the business of the college to make scientific farmers; mechanics and housekeepers, it is necessary to give three kinds of training.

1, Training in general science.
2, Training in technical principles, and
3, Training in the practical application of these principles.

As students come to us wholly unprepared it is needful to give them instruction in general scientific knowledge; and our course of study is designed by its quality, quantity and order of arrangement to give both general training and technical training, also. The practical application of the principles is provided for by the rule of the board of regents that requires each student, male and female, to do manual labor at least one hour each day. To proceed to specific statements.

The agricultural course extends through a period of three years.

The first year is for the most part a work of preparation for the technical studies coming in the second year, and the third year. The chief subjects occupying the attention of the students of the first year are Algebra, English, (including Grammar, Composition and Literature), General History, Free-hand Drawing and Book-keeping. Chemistry is begun, and some work is done in horticulture and agriculture, chiefly methods of propagating, on the one hand, and on the other, stock breeding and the history of domestic animals, as not requiring much previous training.

During the second year the subject of chemistry is introduced, and this renders the scientific study of soils and fertilizers possible, this subject being accordingly taken up. Meantime the student enters upon the study of physiology and botany, physiology throwing some light on zoology and veterinary science, to be taken up during the third year; and botany, rendering the relation of plant life to the soil more intelligible, thus preparing the way to scientific horticulture. The student's previous mathematical training, combined with his knowledge of geometry, pursued during the second year, fits him for understanding trigonometry, a third year's study, continued long enough to give preparation for the surveying, leveling and laying out of drains and roads; these belonging to the third year. Veterinary science and the principles of stock-breeding fill out the course of the third year. It is thought desirable that the student should have some knowledge of political economy, and this belongs to the third year. Each student in this course is required to spend an hour a day for one term of the first year in the shop, learning how to work in wood, and during the second year to spend the same amount of time in learning how to work in iron. The completion of this course entitles the student to the degree, Bachelor of Scientific Agriculture.

Provision is made by a fourth year's course of study in more advanced science and literature for conferring the degree, B. S., on such as desire it, and become entitled to it. The means for illustrating the principles of this course are ample. We have a farm of 180 acres furnished with all the needful appliances—barns, stables, machinery, tools, teams, stock, silo and other things used on a well regulated farm.

The Mechanical Department.

The work of this department is analogous to that of the agricultural department, but differs from it in respect to time, extending through four years instead of three as does the agaicultural course. The degree attained is B. M. E. (Bachelor of Mechanical Engineering).

The first year's work is chiefly preparatory and identical in other respects with the agricultural course, but adding to it mechanical drawing, and requiring shop work instead of farm work. The shop work is confined during the first year to work in wood in the forms of joining and turning; in the second year forge work is begun and continued to the end of the year, while during the third year the student has machine work. The range of the course takes in the principles of mechanism and design, as well as the theory of motors, including the steam engine, and terminates the fourth year with the study of mechanics. To facilitate instruction in the department, the state has provided a mechanical building of the following dimensions (neglecting inches):—75x56 feet, two stories high, containing, on the lower floor, a machine shop 45x36, a blacksmith shop 36x30; on the upper floor, a wood-working shop 56x36, also a printing office and press room 20x20 and a room 13x16 appertaining to the printing office. There is added to the building a wing containing a class-room 18x20 and a room for mechanical drawing 18x29.

The equipment of the shop consists of the following plant and tools:

MACHINERY AND TOOLS IN MECHANICAL HALL.

1 Engine and boiler,
1 Steam Pump,
1 Edison dynamo and complete outfit for electrical lighting.

MACHINE SHOP.

1 Screw-cutting engine-lathe,
1 Speed lathe,
1 Power drill-press,
1 Iron-shaper,
1 Emery grinder (large),
1 Emery grinder (small),
6 Work-benches with iron vises, complete set of drills and reamers.

BLACKSMITH SHOP.

10 Buffalo forges and anvils,
1 Buffalo forge-blower for blast,
1 Exhaust fan,
Vice and tools complete for shops.

WOOD-WORKING SHOP.

2 Wood-turning lathes and tools,
1 Wood-planer,
1 Rip saw and 1 cut-off saw and table,
1 Scroll saw,
1 Band saw,
1 Grindstone,
16 Carpenter benches and tools,
14 Sets of drawing-tables.

Students in the agricultural course must take one term each in wood and iron work in the shops.

Four years are required for the completion of this course which, when completed, leads to the degree, "Bachelor of Mechanical Engineering." To justify this, however, the liberal studies laid down in the course above must also be completed; as the authorities wish to make citizens as well as artisans.

1. View of Students' Hall and Mechanical Hall. 2. Cooking Class. 3. Greenhouse and Potting-House

Department of Household Economy.

This department is intended to fit girls for the duties of housekeeping. The mistress of the family has to dispense what the master provides, and it is believed that this department is therefore the complement and counterpart of the agricultural department; for the prosperity of the family depends as much upon the intelligence and skill of the bread-divider as upon those of the bread-provider. Industrial education, therefore, should be extended to the girls as well as to the boys. During the first year the girls learn to sew and darn and are required to make a book of specimens of their work as a test of their proficiency, and a certain degree of correctness is required as a condition of passing in the department to the second year's class, in which the chemistry and methods of cooking are taught, utensils being provided that the principles taught may be put into practice.

Occasionally lunches are served as a means of instruction in table etiquette.

There are studied also the methods of preserving fruit, during the second year.

The third year furnishes instruction in dressmaking and millinery. Along with these things the students are required to study horticulture, floriculture, kitchen gardening, (these being regarded as legitimately coming in the sphere of woman's work) and special hygiene. Concurrently with these studies there is given a course of liberal instruction nearly identical with the liberal studies of the agricultural course, more attention being given to English literature. The course extends through three years and leads to the degree of Bachelor of Household Economy. The degree, B. L. (Bachelor of Literature), is provided for by a four years course of more advanced studies. The means for illustrating instruction in this department are ample and range from a cambric needle to a large cooking stove and several small ones.

Statement.

A Brief Statement of the Work in Chemistry, Physics, Botany, Zoology, Physiology, Mathematics, History, English, Etc.

CHEMISTRY AND PHYSICS.

These subjects are both taught by the chemist. The course in chemistry includes general chemistry (both organic and inorganic), and analytical chemistry; the last being pursued far enough to enable the students to analyze soils and ores.

There is given in connection with the course, and as a part of it, a series of lectures in the chemistry of common life, including agricultural chemistry. Only experimental physics is taught here. It includes the consideration of sound, light, heat, and electricity. The method of instruction used in both of these subjects is the analytical or regressive. Each student is

furnished with a set of apparatus, and required to work out the principles for himself. The apparatus for illustrating instruction in these subjects is sufficient to make the principles thoroughly intelligible. However, an annual addition to all the apparatus of all the departments is made that nothing may be lacking to the teacher, either for his own instruction or for that of his class.

BOTANY.

The course in botany includes systematic, structural, physiological, cryptogamic, and economic botany. The course in economic botany considers forage plants, textile plants, plants useful for timber and ornamental purposes; also noxious weeds and poisonous herbs come in for a due share of attention. The general principles of forestry also are briefly discussed. The students have each his own set of apparatus, and are required to work the principles from nature, aided by the teacher and a text-book. There are several thousand specimens in the herbarium; and the greenhouse is at the disposal of the botanist for illustration, and furnishes a large variety of exotic and ornamental plants.

ZOOLOGY AND PHYSIOLOGY.

The entomologist of the station teaches zoology and human physiology. The course in zoology includes a special study of entomology. Useful and hurtful insects are fully considered, and the remedies for the latter given. The subject of bee culture is taught both in a theoretical and a practical way, bees being kept on the ground for practical illustration. Here, again, the student is provided means for working out the principles from nature. The museum connected with this department contains some 1200 specimens, and furnishes illustration of all the more important classes and sub-classes of the animal kingdom.

MATHEMATICS.

The range of the course in mathematics covers algebra, geometry, and trigonometry for the lower course, and the infinitesimal calculus for the higher. The principles of the lower course are applied in the study of surveying, leveling, and road-making, which the student pursues in the third year. The work in leveling extends far enough to enable any graduate of the school to lay out drains and roads. The higher course in mathematics is designed for such students as wish to obtain the degree, B. S., by spending four years at the college (one after graduating as Bachelor of Agricultural Science), and for students in the mechanical department as a preparation for theoretical mechanics, pursued in the fourth year of the mechanical course. The department is furnished with a transit and a level, and other apparatus necessary for field instruction.

ENGLISH.

This department takes in the English language (its grammatic composition and literature), moral and social science. Some attention is given to mental science as a preparation for the course in ethics and civil government; the course leading to the degree Bachelor of Agricultural Science includes the English language and political economy; the other subjects—mental science and civil government—are

studied by those only that take the degree B. S., and by the ladies seeking the degree Bachelor of Letters.

HISTORY AND FREE-HAND DRAWING.

These are taught by the Professor of modern languages. History includes the history of the United States and general history and is required of all students alike and the same is true of free-hand drawing and book-keeping.

Amount of Time Given Each Study in Schoolroom.

Studies.	Hrs. per week.	Wks per Ses.
Algebra	5	40
Trigonometry and Geom..	5	40
Surveying	5	7
Anal. Geometry	5	13
Calculus	5	27
Anal. Mechanics	5	13
Chemistry	8	40
Zoology	5	27
Physiology	5	20
Entomology	5	13
Book-Keeping	5	13
Logic	5	13
Botany	5	27
Meteorology	5	13
Political Economy	5	13
Physics	5	40
Plant Physiology	5	13
Psychology	5	13
Special Hygiene	5	13
Ethics and Constit'l. Law	5	13
Sanitary Science	5	13
Mineralogy	5	13
Geology	5	13
History	5	26
English Composition	5	40
English Literature	10	40
Language (including German and French) (Opt)..	15	40
Agriculture	10	40
Horticulture	10	27
Floriculture	10	13
Sewing	5	40
Roadmaking	5	7
Shop-work (Mech. Stu.)	10	40
Shop-work (Agr. Stu.)	5	40
Mechanism	5	27
Steam Engine and Motor..	5	13
Drawing and Design	5	13
Dressmaking—Millinery...	5	13
Marketing and Chemistry of Cooking	5	13
Cooking	5	27
Preserving and Can. Fruits	5	13
Care of Sick	5	13
Kitchen Gardening and House Furnishing	5	13
Social Etiquette	5	13

Military Department.

All students are required to drill daily in the school of the soldier and the company. There has been up to this time no battallion drill. This department is and has hitherto been in charge of the professor of mathematics, who has given entire satisfaction, but the growth of the institution requires that the military department be placed in the hands of an army officer and the board of regents are trying to get such officer. The officers of the companies and the senior class study Upton's infantry tactics.

Miscellaneous.

The terms of admission to the college are that the pupil be fifteen years old and be able to pass an examination in arithmetic, elementary English, grammar, reading, and spelling. A written examination is required. A preparatory department is connected with the college, there being no special preparatory schools in the State. The State furnishes a hundred and twenty-three free scholarships. All other pupils pay a small tuition fee of fifteen dollars a year.

Board of Regents.

Hon. Wm. S. Ladd, President, Portland.
Hon. Wallis Nash, Secretary, Corvallis.
His Excellency, Gov. Sylvester Pennoyer, Salem.
Hon. George W. McBride, Sec'y. of State, Salem.
Hon. E. B. McElroy, State Supt. Pub. Inst'n., Salem.
Hon. H. E. Hayes, Master of State Grange, Oswego.
Hon. H. T. Apperson, Oregon City.
Hon. T. W. Davenport, Silverton.
Hon. John Emmett, Umpqua Ferry.
Hon. W. P, Keady, Portland.
Hon. J. K. Weatherford, Albany.
Hon. W. A. Sample, Helix.

EXECUTIVE COMMITTEE.

Hon. J, T. Apperson, Oregon City.
Hon. H. E. Hayes, Oswego.
Hon J. K. Weatherford, Albany.
Hon. A. R. Shipley, Corvallis.
Hon. Wallis Nash, Secretary, Corvallis.

Faculty.

B. L. Arnold, A. M., President and Professor of English.
J D. Letcher, C. E., Professor of Mathematics and Civil Engineering.
F. Berchtold, A. M., Professor of Modern Languages, History, Drawing and Music.
Margaret C. Snell, M. D., Professor of Household Economy and Hygiene.
Grant A. Covell, M. S., Professor of Mechanics and Mechanical Engineering.
F. L. Washburn, A. B., Professor of Zoology and Entomology.
H. T. French, M. S., Professor of Agriculture.
Moses Craig, M. S., Professor of Botany.
Geo. Coote, Instructor in Horticulture.
G: W. Shaw, A. M., Professor of Chemistry.
W. W. Bristow, A. B., Principal Preparatory Department.

STATION.

In 1888, the board of regents organized the Experimental Station by appointing a staff of workers and prescribing rules for their guidance. The staff consisted of the following persons:

E. GRIMM, B. S., Director and Agriculturist.
E. R. LAKE, M. S., Botanist and Horticulturist.
P. H. IRISH, Ph. D., Chemist.

The following is a list of the present staff.

B. L. ARNOLD, A. M., Director.
H. T. FRENCH, M. S., Agriculturist.
F. L. WASHBURN, A. B., Entomologist.
G. W. SHAW, A. M., Chemist.
GEO. COOTE, Horticulturist.
MOSES CRAIG, M. S., Botanist.
DUMONT LOTZ, Assistant Chemist.

The rules prescribed for the government of the Station Staff are these:

1. The Board of Regents has Executive control of the Station, is responsible for its expenditures; apportions the income among the several departments of the Station; elects the members of the working force; orders and directs, in general terms, the nature of the scientific work to be undertaken by the working force, in its various departments, and assumes, from time to time, such other duties as may appear to the Board to be involved in, or arise from, any of the foregoing items, including the establishment of branch Stations in various parts of the State.

2. A Station Council is hereby created, consisting at first of the President of the College, the Director of the Station, and the Agriculturist, Botanist and Chemist of the Station force. Changes or additions may be made be the Board of Regents from time to time as fresh departments are added to the Station force, or re-arrangements effected therein.

The President of the College is, *ex-officio* the President of the Station Council, with the powers and functions in carrying on the business of the Council, usually attached to the office of President. He is the official representative of the Station Council in its relations with the Board of Regents.

THE FUNCTIONS AND DUTIES OF THE COUNCIL ARE:

(A) To prepare plans of scientific work and to submit same to the Board of Regents, with financial estimates for carrying the same out.

(B) When such plans shall have been approved by the Board of Regents, to apportion the same among the members of the working force, and submit to the Board periodical reports of the progress of the same.

(C) To prepare and submit to the Board, quarterly, the drafts of the Bulletins, which are by law demanded from the Experiment Station, and, when the same have been printed, to see to the due publication of the same.

(D) To promote in all practicable ways Farmers' Institutes in various parts of the State of Oregon, held under the direction of the State Agricultural College.

3. The Director of the Station shall maintain a general and daily oversight of the various departments, and report the condition of the work to the Station Council.

He shall examine and certify all requisitions for purchases demanded, and all vouchers for payments needing to be made by the departments. He

shall cause to be kept, and shall be responsible for the accuracy of all Station labor accounts. He shall have charge of the Station correspondence, except in cases where the Council may apportion such correspondence among other members.

4. Each member of the Station force shall be independent in, and shall be responsible for, the work of his own department, receiving and carrying out the general instructions from the Station Council, and furnishing such periodical reports of the progress of work as he may from time to time be requested to supply. When supplies or outfit are needed, the particulars shall be shown on a written requisition, signed by the head of the department, and by him handed to the Director. All accounts or invoices for such supplies or outfit shall be procured by the head of the department in question, and, if correct, shall be so certified by him and handed to the Director.

Bulletins.

The following is a list of all the bulletins issued by the Station since its organization:

DATE.	NO.	SUBJECT.	AUTHOR.
1888–89	1	History and Organization	E. Grimm.
1889–90	2	Horticulture and Notes on Future Work	E. R. Lake.
1889–90	3	Entomology and Chemistry	Irish and Washburn.
1889–90	4	Depts. of Agriculture, Horticul. & Chem.	Washburn and Irish.
1889–90	5	Entomology, Zoology and Chemistry	Washburn and Irish.
1890–91	6	Chemistry and Economic Zoology	Irish and Washburn.
1890–91	7	Comparative Tests of Small Fruits	George Coote.
1880–91	8	Notes on Varieties of Wheat and Flax	H. T. French.
1890–91	9	Silos and Silage	H. T. French.
1890–91	10	Practical Work at the Station The Hop Louse	F. L. Washburn.
1890–91	11	Notes on Grasses and Potatoes	H. T. French.

Our bulletin list includes some 3000 names besides those on the station list, and the demand for bulletins is increasing.

Outline of the Work of the Departments of the Station.

THE AGRICULTURAL DEPARTMENT.

The experiments now in progress relate to the grasses, clovers, and forage plants, silos and ensilage; farm crops, rotation and feeding.

EXPERIMENTS WITH GRASSES.

A list of these will be found in Bulletin 4. They are sown in plots of known dimensions and have been under investigation for three years. The crops have been regularly cut and weighed, and the sod observed. The results so far are:

1. That *Sorghum halepense* is worthless for hay, and the same is true of Bermuda grass and Kentucky blue grass.

2. Those most suited to our climate and soil are, so far as our experiments go, are *Dactylis glomerata* (orchard grass), *Avena Elatior* (tall oat grass), *Lolium Perenne* (English rye grass), *Festuca Elatior* (tall fescue) *Avena Flavescens* (yellow oat grass), *Agrostis Vulgaris* (red top), especially for white soils: *Bromus inermis, Phleum pratense* (timothy). Many others are promising as hay crops; but it is yet too early to determine their value. So far as regards pasture grasses, the following hold the first place,

apparently at least, forming a good sod and an aftermath relished by stock of all kinds: *Agrostis Stolonifera* (creeping bent), *Alopecunus pratensis* (meadow fox tail), *Festuca ovina* (sheep's fescue), *Poa arachnifera* (Texas blue grass) *Poa nemoralis* (wood meadow grass). The following seem useless as pasture grasses unless sown in a mixture with other grasses, viz: *Festuca heterophilla*, *Festuca duriuscula*, *Poa compressa*, *Anthoxanthemum odoratum*. Of the clovers it may be said that Alsike Mammoth (red clover), medium red and white, are all that can be declared successful up to this time. The following forage plants deserve notice as doing well here: *Onobrychus Sativa*, *Vicia Sativa*, *Seredella*, Corn, Sorghum, and Canada Peas, while *Rena luxurians*, *Lespedeza Striata*, *Trifolium incarnatum* are doubtful.

Silos and Silage.—It has been made evident to the farmers that by using silos it is possible to save much food that would otherwise go to waste, and the humidity of our climate renders silos peculiarly valuable here.

3.—FARM CROPS.

Experiments with farm crops have been made with a view to determine the varieties suited to our soil and climate. We have had under investigation 400 varieties of potatoes, 70 of corn, 70 of wheat, 20 of oats, 6 of barley, 4 of buckwheat, and 3 of flax. The following results may be given as trustworthy:

There are found suited to our soil and climate 15 varieties of potatoes, 5 varieties of corn (tested for fodder only), 6 varieties of wheat, 20 of oats, and of these last the White Russian oats are the best. Black barley has done best for us, and Japanese buckwheat excels all others. No results respecting flax can be given as yet.

4.—ROTATION.

The experiments in rotation have just begun, and it is of course too early for results.

5.—FEEDING.

Experiments in feeding are in progress, and the results will be given in the next report.

6.—UNDERDRAINING.

Experiments in underdraining have been undertaken with a view to demonstrate to farmers that it can be done successfully and profitably, there having been much incredulity on the subject in our state.

FUTURE WORK.

The future work of this department as now laid out is:

1. To continue the experiments already begun as a matter of verification.
2. Feeding experiments with three distinct objects: *a*, to show that animals may be matured early with a profit; *b*, to find the proper combination of food materials as found in this State; *c*, to test breeds.
3. *a*, Dairying as affected by breed, care of stock, food, etc; *b*, co-operative dairying to show farmers its practicability.

WORK OF THE CHEMICAL DEPARTMENT.

Co-operative work was begun last year 1890-91 to determine: 1, whether sugar beets could be raised here successfully; 2, in what parts of the state

they would grow well, and, 3, their economic value. So far as these experiments go they show that a good quality of beets can be raised here. The analyses made by Professor Irish who then had charge of the chemical department, show a yield of sugar ranging from 5.8 to 16 per cent., with an average of 11 per cent.

A second line of work undertaken by Prof. Irish was to determine the comparative digestibility of silage, when cooked, and when uncooked. The following table gives the results reached.

SUMMARY OF RESULTS.

"The effect of cooking ensilage is: First, to decrease digestibility of nitrogenous substances. Second, to increase digestibility of crude fiber. Third, to increase the digestibility of nitrogen free extract. Fourth, to increase digestibility of fat. Fifth to increase the amount of sugar contained.

"Alcholic fermentation takes place in the silo by which time the alcohol is formed.

"Soluble nitrogen may not be properly reckoned as completely digestible.

As far as can be concluded from the observations given above cooking ensilage as a food for stock will not pay, on account of the decrease of digestibility of the nitrogenous substances. P. H. IRISH, Chemist."

A third experiment was made with plants said to be poisonous to cattle—Larkspur, *Senicula horrelli*, and wild parsnips. The results are thus stated by Prof. Irish: The results given above would seem to prove without doubt that the plants experimented with are not poisonous to cattle at the stage of their growth at which they were made use of. See Bulletin, No. 3, page 26.

Fourthly, the study of the varieties of wheat was begun to ascertain the variation in composition caused by differences of soil and climate. No conclusions were reached.

FUTURE WORK.

The work now in progress and planned for the future is: 1, The continuation of the experiments with the sugar beet with a view to its economic value; 2, to make complete analysis of the several soils of this state as preliminary to an agricultural survey of the State; 3, to enter upon the analysis of the mineral waters of the State; 4, to make such miscellaneous analyses as may seem to be of general and prime importance; 5, to examine such foods and medicines as may be sent to us by the food commission.

EXPERIMENTAL WORK IN BOTANY.

(See remarks in introduction). This will include the following subjects of investigation:

1. A careful study of the weedy and poisonous plants of the State with the object of finding out the best methods of destroying them and remedying their ill effects. An effort will be made by means of letters and circu-

lars to reach all interested in this work and their co-operation will be asked.

2. A study of the forest conditions in Oregon, first, with the view to prevent the great waste of timber by forest fires and, second, to introduce tree culture in the eastern part of the State. 3. The study of the forage plants, especially grasses and clovers, to determine their value and adaptability to various soils and conditions. 4. A study of plant diseases and their influence on cereals, vegetables and fruits. 5. The collection and addition to the herbarium of as many new specimens as possible; also the making of exchanges with other botanists. 6. Collecting as many forms of parasitic fungi as possible preparatory to catalogueing rusts and mildews of the State. Other lines of work will be taken up from time to time as occasion seems to demand.

WORK OF THE HORTICULTURAL DEPARTMENT.

(See introductory remarks.)

The work now in progress in this department is briefly this: First, to test the relative value of certain varieties of fruits both large and small, and their adaptability to our climate. Of large fruits there are under investigation 96 varieties of apples, 21 of plums, 16 of cherries, 42 of peaches, 4 of prunes, 4 of quinces, 36 of grapes; of small fruits, 33 varieties of gooseberries, 8 of currants, 6 of blackberries, 3 of raspberries, and 40 of strawberries. These are to be studied to determine their comparative hardiness, earliness, quickness of maturity, their diseases and economic value. This remark is applicable to the experiments with garden vegetables, of which there are a hundred and fifty varieties under experiment, distributed as follows: 31 varieties of cabbage, 15 of lettuce, 12 of cauliflower, 26 of peas, 61 of tomatoes, and 8 of radishes. Another experiment in progress is to determine the relative merit of "piece-root" and whole-root" grafting. Many varieties of trees have been grafted by either method, and the effects are under observation. A fourth experiment is to determine the best method of renewing old orchards. A fifth to improve native varieties by cross-fertilization. A sixth, to test new varieties of fruits and vegetables. A seventh, is an attempt to improve the hardiness of the peach by grafting on the plum. In addition to this work the work begun by Prof. Lake (the testing of the purity and vitality of commercial seeds) will be continued.

DEPARTMENT OF ENTOMOLOGY.

The experiments in this department have been directed chiefly to insects and insecticides. The following list includes the insects under experiment: The codling moth, the hop louse, *Phorodon humuli*, the woolly *aphis*, the green *aphis* and the so-called grain weevil, *sylvanus surinamensis*, the peach tree borer and some others of less importance. The insecticides used are these: Paris green combined with a fungicide; 2, kerosene emulsion; 3, bisulphide of carbon; 4, Paris green in simple soap solution.

I.—EXPERIMENTS WITH PARIS GREEN FOR CODLING MOTH.—RESULTS.

The spraying of the trees with a solution of Paris green and water in proportion of one pound of Paris green to 300 gallons of water with a little

whale-oil soap, continued from the dropping of the bloom till the fruit was near its maturity, saved from 70 to 90 per cent. of the fruit.

REMARKS.

It has been observed: 1, That foliage here is more tender than that east of the Rocky mountains, and requires, therefore, a more dilute solution; 2, that the codling moth is many-brooded here and requires for its destruction spraying at regular intervals of 18 days from the dropping of the bloom till the 25th of September for winter apples; 3, that six pounds of whale-oil soap, or soft soap of any kind, added to the solution makes it adhere longer to the fruit; 4, that larvæ of the codling moth are most destructive the latter part of August and during September, calling for diligent work at that time; 5, that spraying with a combined insecticide and fungicide (whale-oil soap and sulphite of soda combined with Paris green, one pound of the latter to 300 gallons the former mixture) has no great advantage as an insecticide over Paris green solution so far as the codling moth is concerned, but is an efficient fungicide when properly applied. This solution is excellent for keeping in check woolly aphis, one of our worst pests, and for killing the green aphis on apple trees.

2.—EXPERIMENTS WITH THE SO-CALLED WEEVIL.—*Silvanus Surinamensis.*

The bins were 20x20 feet, holding 3000 bushels; a gaspipe was introduced and run to the bottom of the bin, the bisulphide of carbon being poured into the pipe. The quantity of bisulphide of carbon used, a gallon and a half. The expense incurred was about three dollars a bin.

Carbon sulphide has been found the best remedy against this pest. It has been applied with perfect success to large bins of wheat (3000 bushels in a bin), destroying the insect so thoroughly as to render infected wheat as marketable as wheat uninfected.

3.—EXPERIMENTS WITH THE HOP LOUSE.

Co-operative experiments are in progress to check the ravages of the hop louse. No definite results can be given, but two facts seem worthy of notice: 1, That the hop louse shows a marked preference for the wild plum known as Peterson's seedling as a place of deposit for its winter eggs. 2, That no hop-louse eggs have been observed by our entomologist on the Italian Prune.

4.—EXPERIMENTS WITH A SUGAR-BEET BEETLE.—*Monoxia Guttulata.*

One pound of Paris green, 100 gallons of water and 6 pounds of soft soap, or whale-oil soap, form a mixture that will effectually kill this insect without injury to the beet, the mixture being sprinkled on the leaves by means of a watering pot.

5.—EXPERIMENTS WITH THE PEACH-TREE BORER.

The best preventive found is to wrap the trunk with paper (newspaper is good) from June 1st to October 30th. This prevents the insects from depositing its eggs and does the tree no injury. A second good remedy is to wash the trunks with a solution of whale-oil soap in crude carbolic acid

(one part of acid in 5 gallons of soap). This washing should be done about June 1st, and about August 13th.

BRIEF OUTLINE OF STATION WORK, ENTOMOLOGICAL DEPARTMENT, FOR 1891 AND 1892.

1, Continuation of experiments with codling moth to determine best time to spray fruit trees, the least number of sprayings necessary, and least possible expense at which such work can be done. 2, Co-operative experiments on hop louse. 3, Experiments continued on other lice, i. e., woolly aphis, *aphis mali*, *pruni persical*, etc. 4, On borer of the peach and apple trees. 5, On cut-worms. 6, On flea beetles. 7, Most practical spraying outfit for use in large orchards. 8, Lessening the ravages of the pocket gopher. 9, To demonstrate the practicability of caponizing cockerels for Oregon market. 10, Answering letters of inquiry, regarding injurious insects, from farmers and fruit-growers. 11, Institute and bulletin work.